SUDDEN IMPACT

AEDC's chicken gun reduces risk to aircrews

AEDC plays a major role in increasing flight crew safety with its bird impact range.

Relatively low tech compared to the center's wind tunnels, engine test cells and space chambers, AEDC's chicken gun has helped aircraft manufacturers make aircraft safer from bird strikes.

Using high-pressure air, employees shoot four-pound chicken carcasses from a 60-foot long launch tube at speeds up to 700 mph to simulate a direct birdstrike. Videotapes and high-speed motion picture cameras operating at speeds up to 10,000 frames per second provide visual data on what actually occurs during a simulated birdstrike to determine the ability of the aircraft parts to withstand the impact and the damage caused during impact. Aircraft manufacturers use the data to redesign and build components before flight, saving thousands of dollars.

"If we can find and fix something in the development stage, it is much more less costly than discovering it during flight," said Col. Craig Christen, AEDC director of operations. "AEDC has a center of expertise that understands the unique characteristics of a birdstrike and the component standards needed to prevent damage. Tests conducted at the center ensure the designs are adequately tested to meet these standards before flight."

According to Randall Watt, project engineer at the chicken gun, the need for the facility surfaced during the Vietnam War when the F-111 aircraft equipped with terrain-following radar allowed pilots to fly at high speeds only a few hundred feet above the ground. At these low altitudes pilots encountered thousands of birdstrikes each year.

"Birds have been a hazard ever since there have been airplanes." Watt said. "But the situation didn't become really critical until planes started flying very fast and close to the ground."

Consequently, the Air Force tasked the Aeronautical Systems Division at Wright-Patterson AFB, Ohio, to address



An F-16 Fighting Falcon canopy undergoes evaluation.

the bird impact hazard, "Familiar with AEDC's range gun Northrop Grumman Gulfstream V commercial aircraft experience, Wright-Patterson asked AEDC what it would take to develop some sort of birdstrike test." Watt said.

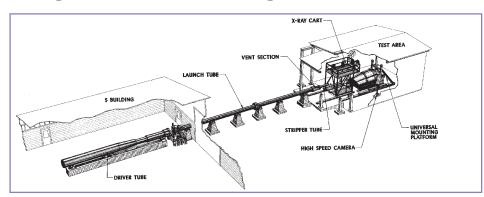
gun, and AEDC engineers built the facility using scrap hardfirst shot Sept. 14, 1972, at an F-111 crew escape module.

Since then, the chicken gun has made more than 1,300 shots. F-16, F/A-18, F-111, T-6A, T-37, B-1 and the C-130 and the edge at 270 knots.

Christen was one of the people saved by F-111 canopy improvements validated by the chicken gun. "Many other Working together they developed the idea for the chicken pilots and crewmembers and I are alive because of this program," Christen said, "The folks at Arnold continue to help ware including an old 8-inch Naval gun. They launched their the warfighter survive and operate in a very unforgiving environment."

Members of the AEDC Ballistic Impact Range S3, bettesting windshields and canopies of the majority of the De- ter known as the chicken gun, made the 1300th shot last fense Department's inventory including the A-7, A-10, F-15, year on a Raytheon Aircraft T-6A Texan II wing leading

Range S3 – the chicken gun



Birdstrikes still major concern for AF pilots

mations of Canada geese winging their way to warmer climates earlier this fall, it's hard to imagine these noisy fowl as lethal

be when they collide mid-air with tary aircraft since 1985. aircraft. According to the Bird Strike Committee USA, a 12pound Canada goose struck by a 150-mph aircraft at lift-off generates the force of a 1,000-pound weight dropped from a height of 10 feet. It's this kind of force that

since the first recorded fatal birdstrike Col. Craig Christen, birdstrike in 1912

Since 1960, aircraft-wildlife collisions involving birds destroved 20 U. S. registered com-But that is exactly what they can mercial aircraft and 23 U.S. mili-

The most common impact areas on the aircraft include the engine inlet, the nose, the canopy and the wing.

than 2,500 strikes annually. This doesn't include strikes to commer-

were sucked into the airplane's en-AEDC's director of operations. experienced during flight training was one of 34,800 occurring between 1985 and 1997, According to a bird-aircraft collision. to Air Force reports, these collisions caused estimated damages

upwards of \$470 million. The worst incident in the U.S. occurred four years ago. In 1995. all 24 crewmembers aboard an E-Air Force officials report more 3B Sentry Airborne Warning and Control System (AWACS) aircraft

gines during takeoff from Elmendorf AFB. Alaska, making it the single worst loss of life due The following year, 34 people died when a Belgian Lockheed C-

130 collided with a flock of about 500-600 starlings and crashed while landing at Eindhoven Airbase in Eindhoven, Netherlands.

During his career, Christen observed the damage to a C-5A that Del when it hit more than 85 snow geese and watched a Thunderbird T-38 crash in Cleveland due to seagull ingestion into the engines.

The U.S. Bird Strike Committee reported that increasing fowl populations such as Canada geese pelicans, starlings and blackbirds. will increase the number of birdstrikes, and will cause an estimated \$149 million in damage

Canopy testing saves colonel's life

"I was at the Air Force Test Pilot School

When student test pilot Craig Christen came face to face with a hawk in the sum-



death when the bird struck the windshield (canopy) of his F-111 aircraft.



the instructor pilot was in the systems per hour. operator's seat. We were flying at about 500 Christen, now an Air knots and had gone through canyons using Christen said. "I still have the small section Force colonel and the center's director of terrain-masking techniques on autopilot. operations, vividly recalls the harrowing Just as we entered bomb range, we switched to manual flight," he said.



Randall Watt loads a sabot carrying a thawed chicken carcass into the gun for a bird strike test

"All of a sudden, the front windshield deployed to Cannon AFB, N.M., for an F- canopy crashed in, crazed over [cracked], mer of 1985, he was al- 111 orientation flight. We were flying a and bowed in onto the heads-up display and simulated ground attack mission where we a small piece of the windshield inner lamiwere going to enter a low-level run using nate layer fell onto my lap. At that point, my forward visibility was zero."

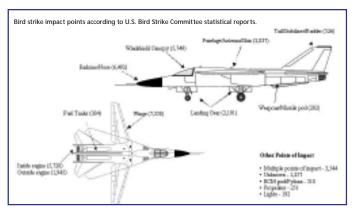
The hawk hit the left windshield head on at 510 knots at an altitude of 100 feet above "I was in the pilot's seat (left) seat and the ground-equivalent to about 600 miles

"At that speed, I never saw the bird." of the windshield where the hawk hit. It has a perfect mold of the bird's head."

Lucky for him, the last tonic covered in the prebrief had been on birdstrike procedures. Using these procedures, Christen pulled back on the stick to increase altitude, told the instructor pilot he was okay, and the two airmen safely returned to the base.

A combination of newly acquired flying skills and developmental redesign of the F-111 windshield based on AEDC testing saved their lives. During the prebrief discussion on birdstrike procedures, Christen had been told about the F-111 losses during Vietnam due to birds coming through the windscreen and the improvements that had

"Without AEDC's validation and developmental testing on aircraft canopies, the bird would have penetrated the windshield," Christen said. "At that point, I would have become blinded and disoriented, or even killed, by the sudden inrush of high-pres sure air and flying objects. I could not have reacted in that space of time and would have lost control of the aircraft and crashed."





Outside machinist Chris Mitchell secures a wing leading edge of a Northrop Grumman Gulfstream V. This 1996 test was the first commercial bird impact test. The Gulfstream V is an ultra-long-range business jet that can fly non-stop 6,500 nautical miles, carry eight passengers and a crew of four at Mach .8 while cruising at an altitude of 51,000 feet



Randall Watt inspects the damage done by a chicken carcass traveling at 310 mpl when it strikes a C-130 windshield. Top speed for the bird bullets reaches 918 mph



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Photos by Gary Barton. David Househ and AEDC photo lab